REMARKS

This application has been reviewed in light of the Office Action dated March 4, 2003. Claims 1-4 and 6-15 are presented for examination. Claims 1, 6, 7, and 10-15 have been amended to define more clearly what Applicant regards as his invention. Claims 1, 7, and 11-15 are in independent form. Favorable reconsideration is requested.

Claims 1, 3, 4, 6, 12, and 14 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,572,632 (*Laumeyer et al.*), in view of U.S. Patent No. 5,872,895 (*Zandee et al.*) and U.S. Patent No. 5,495,542 (*Shimomura et al.*). Claims 7-11, 13, and 15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,923,834 (*Thieret et al.*) in view of *Laumeyer et al.* and *Shimomura et al.* Claim 2 was rejected under 35 U.S.C. § 103(a) as being unpatentable over *Laumeyer et al.* in view of *Zandee et al.* as applied to claim 1, and further in view of *Thieret et al.*

As shown above, Applicant has amended independent claims 1, 7, and 11-15 in terms that more clearly define what he regards as his invention. Applicant submits that these amended independent claims, together with the remaining claims dependent thereon, are patentably distinct from the cited prior art for at least the following reasons.

As is discussed in the specification of the present application, output images of a printing apparatus change depending on changes in environmental conditions such as temperature, humidity, and the like. If the printing apparatus is of an electrophotographic type, formed visible images change due to the deterioration of expendables of the printing apparatus, such as a drum or toner cartridge. Conventional printing apparatuses calibrate to correct certain kinds of corrections, but generally the conventional corrections insufficiently adjust for the changes.

For example, in order to match the density data of an original image to be output by a current printer in correspondence with the original density data, a controller unit generates binary image data to be input to a engine unit on the basis of the original image in consideration of the density differences. However, when a host computer binarizes data and transmits binary image data to the printing apparatus, the controller cannot detect the density differences between the original image and output image, and calibration in the printer cannot sufficiently correct the data.

The present invention provides a solution to this problem, making it possible for the image processing to reflect the condition information of the original image.

More particularly, the aspects of the present invention set out in the respective independent claims involve an image processor decreasing a bit length for each pixel of an image data processed using condition information, and then outputting the bit-length-decreased image data to the image output via a communication line.

The aspect of the present invention set forth in claim 1 is an image processing apparatus that includes a communicator, an input unit, an acquisition unit, and an image processor. The communicator performs two-way communications with an image output unit, which includes an update unit for updating condition information, for calibration, indicating a condition of the image output unit and a memory for storing the condition information. The condition information is obtained by forming color patches and measuring colors on the color patches. The input unit inputs an image output instruction, in response to which the acquisition unit acquires the condition information stored in the image output unit by utilizing a two-way communication.

The image processor performs image processing of image data in accordance with the condition information acquired by the acquisition unit. The image

processor decreases a bit length for each pixel of the image data processed using the condition information which is used for calibration and then outputs the bit-length-decreased image data to the image output unit via a communication line.

Specifically, in a preferred embodiment, the image processing apparatus (host computer 100) acquires the condition information (correction data, for calibration, regarding the condition of the image output unit) generated by a color calibration unit and then performs image processing to generate bitmap data formed by pixels, each of which is quantized (bit-length-decreased) using the correction data. In other words, image processing on the image data to reflect the condition information is performed prior to the bit-length-decrease processing. If the bit-length-decrease processing is performed first, the condition information cannot be effectively reflected in the bit-length-decreased image data. For example, in the case where image data before bit-length-decrease processing is performed has 256 tone levels (8 bits per pixel) and the bit-length-decreased data has two tone levels (i.e., binary image data), it is difficult to correct the binary image data using the condition information because the tone level of a binary pixel is either "0" (corresponding to lightness) or "1" (corresponding to darkness). Condition information, on the other hand, can be easily reflected in image data which has not been bit-length-decreased.

The applied art, alone or in combination, is not seen to disclose or suggest the aspect of the invention as recited in independent claim 1, particularly with respect to an image processor for performing image processing of image data in accordance with the condition information acquired by the acquisition unit, where the image processor decreases a bit length for each pixel of the image data processed using the condition information and then outputting the bit-length-decreased image data to the image output

unit via the communication line, and an update unit for updating condition information indicating a condition of the image output unit.

Laumeyer et al., as understood by Applicant, relates to a printing system which permits choosing any of a number of multiple output devices, such as color printers, of a kind for a printing job in which an output image is to be printed on a selected medium. The *Laumeyer et al.* system permits selecting alternative medium for such a printing job, and that all such selections are made without requiring further processing of pixel data or image input data by the system raster image processor. Apparently, *Laumeyer et al.* teaches converting a color space using a profile generated by measuring the color of a patch and transmitting data stored in a frame buffer 16 to a printer 19 (output device).

Specifically, the output device color gamut is characterized to establish the correspondency of printed colors to the intermediate L*a*b* color space. Each permitted spatial location in the L*a*b* color space that is within the output device color printer reproducible color gamut is arranged to transform to that set of CMY coordinates paired by an effective or measured color patch to that permitted spatial location that is closer to the location being transformed than any other similarly paired permitted spatial location. Similarly, each permitted spatial location in the L*a*b* color space outside of the output device color printer reproducible color gamut is arranged to transform to that set of CMY coordinates associated with the effective or measured color patch at the edge of this gamut having the closest color to that specified by the location being transformed (column 11, lines 7-19).

Accordingly, *Laumeyer et al.* merely discloses reproduction of color images generated by one of alternative input sources through the use of one of alternative output devices, where the output device color gamut is characterized to determine a

correspondency of printed colors to an intermediate L*a*b* color space. However, nothing has been found in *Laumeyer et al.* that teaches or suggests the features of the claimed invention, and in particular an image processor for performing image processing of image data in accordance with the condition information acquired by the acquisition unit, where the image processor decreases a bit length for each pixel of the image data processed using the condition information and then outputs the bit-decreased image data to the image output unit via the communication line, as recited in claim 1.

The Office Action alleges that *Laumeyer et al.* teaches an update unit for updating condition information indicating a condition of the image output unit, and cites column 11, lines 50-60 as support therefor. However, Applicant disagrees with this understanding of *Laumeyer et al.*, and submits that additional profiles (characterization of output device color gamut) for either new output devices or new media for current output devices are able to be added to the *Laumeyer et al.* system, but not to update the condition information indicating the condition of the image output unit. Accordingly, nothing has been found in *Laumeyer et al.* that teaches or suggests the features of claim 1, and in particular an update unit for updating condition information indicating a condition of the image output unit, as recited in claim 1.

For at least the above reasons, independent claim 1 is believed clearly patentable over *Laumeyer et al.*, taken alone.

Zandee et al. is cited in the Office Action as remedying some of the deficiencies of *Laumeyer et al.* *Zandee et al.* relates to a method for object-based color matching when printing color documents. Apparently, *Zandee et al.* teaches communication of color information between a device and a computer. The Office Action states that *Zandee et al.* teaches a two-way communicator and an acquisition unit.

However, nothing has been found in *Zandee et al.* that teaches or suggests the features recited in claim 1, and in particular, an image processor for performing image processing of image data in accordance with the condition information acquired by the acquisition unit, where the image processor decreases a bit length for each pixel of the image data processed using the condition information and then outputs the bit-length-decreased image data to the image output unit via the communication line, nor an update unit for updating condition information indicating a condition of the image output unit.

Thieret et al. is not seen to overcome the deficiencies of *Laumeyer et al.* and *Zandee et al.*, particularly with respect to an image processor for performing image processing of image data in accordance with the condition information acquired by the acquisition unit, where the image processor decreases a bit length for each pixel of the image data processed using the condition information and then outputs the bit-length-decreased image data to the image output unit via a communication line, nor an update unit for updating condition information indicating a condition of the image output unit, as recited in claim 1. *Thieret et al.*, as understood by Applicant, relates to a server for monitoring machine data, predicting trends, and providing a corrective response, and to a hierarchical system of providing predetermined degrees of the response on the basis of a single machine, set of machines, or a plurality of sets of machines. Apparently, *Thieret et al.* teaches that a machine server, connected with a color printer, analyzes a trend of the printer and performs a diagnostic process. The machine server determines the remaining amount of toner and a proper setting point of the driving voltage (column 5, lines 14-26). However, nothing has been found in *Thieret et al.* that teaches or suggests an image processor for performing image processing of image data in accordance with the condition information acquired by the acquisition unit, where the image processor decreases a bit

length for each pixel of the image data processed using the condition information and then outputs the bit-length-decreased image data to the image output unit via a communication line, nor an update unit for updating condition information indicating a condition of the image output unit, as recited in claim 1.

Shimomura et al. is cited in the Office Action as remedying the deficiencies of *Laumeyer et al.*, *Zandee et al.*, and *Thieret et al.* *Shimomura et al.* relates to image processing using a neural network. In Applicant's view, nothing has been found in *Shimomura et al.* that teaches or suggests an image processor for performing image processing of image data in accordance with the condition information acquired by the acquisition unit, where the image processor decreases a bit length for each pixel of the image data processed using the condition information and then outputs the bit-length-decreased image data to the image output unit via a communication line, nor an update unit for updating condition information indicating a condition of the image output unit, as recited in claim 1.

For all these reasons, Applicant strongly urges that even if *Laumeyeret al.* is combined with *Zandee et al.*, *Thieret et al.* and/or *Shimomura et al.* in the proposed manner (and assuming for argument's sake that such combination would be proper), the result would not meet the terms of claim 1. Accordingly, claim 1 is believed to be clearly allowable over *Laumeyeret al.*, *Zandee et al.*, *Thieret et al.* and *Shimomura et al.*, taken separately or in any proper combination.

Independent claims 12 and 14 are method and computer-readable storage medium claims respectively corresponding to apparatus claim 1, and are believed to be patentable for at least the same reasons as discussed above in connection with claim 1 Additionally, independent claims 7, 11, 13, and 15 include the similar features of an image

processor for performing image processing of image data in accordance with the condition information acquired by the acquisition unit , where the image processor decreases bit length for each pixel of the image data processed using the condition information and then outputting the bit-decreased image data to the image output unit via the communication line, and updating condition information, as discussed above in connection with claim 1. Accordingly, claims 7, 11, 13, and 15 are believed to be patentable for reasons substantially similar to those discussed above in connection with claim 1.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual reconsideration of the patentability of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicant respectfully requests favorable reconsideration and early passage to issue of the present application.

Applicant's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,

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